REMARKS

Claims 30-51 are present in this application. Claims 30, 34, 41, and 48-51 are independent.

Objection to the Disclosure

The disclosure has been objected to because claim 34 is a single means claim. Applicants have amended claim 34 accordingly. Thus, Applicants respectfully request that the objection be reconsidered and withdrawn.

Claim Rejection - 35 USC 112

Claims 34-47 have been rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. Applicants have amended claims 34 and 41 accordingly. Applicants respectfully request that the rejection be reconsidered and withdrawn.

Claim Rejection - 35 USC 102

Claims 30-47, 50 and 51 have been rejected under 35 U.S.C. 102(e) as being anticipated by Rathonyi et al. (U.S. Patent 6,359,877, hereinafter "Rathonyi"). Applicants respectfully traverse this rejection.

The present invention, in a preferred embodiment, is directed to a communications method which uses a data packet composed of a

plurality of error correction blocks of block-type error correction codes. The present invention is an improvement over a hybrid ARQ method, in which an ARQ method and an FEC method are combined. In an FEC method, the receiving end carries out error correction by referring to a redundant code added by the transmitting end. A problem with the conventional hybrid ARQ method has been that even though errors are corrected at the receiving end, a large number of buffers are still required in the transmitting and receiving ends. Also, because of large sized packets, retransmission takes up substantial bandwidth.

The present invention consists of a combination of an FEC error correction at the receiving end and retransmission of error correction blocks in the event of uncorrectable blocks in a packet received at the receiving end. In the present invention, an error correction state of each block is transmitted from the receiving end to the transmitting end. The present invention ensures high throughput by adding a block, which according to the error correction state requires retransmission, to a data packet to be transmitted. Such a combination reduces the required number of buffers in the communications system and the communication bandwidth.

Rathonyi

Rathonyi discloses a communication system that minimizes overhead in packet re-transmission. In particular, the communication system takes advantage of the excess overhead that exists in higher transmission rate transmissions (see column 5, lines 11-25), in the case of variable transmission rates. Also, the communication system uses variable rate packet re-transmission which supports Type II hybrid ARQ. In Type II hybrid ARQ, data redundancy is increased until received information is successfully decoded (see column 4, lines 51-53).

In order to minimize excess overhead, packet size and transmission rate are adapted. In the communication system of Rathonyi, one or more packets are transmitted in each transmission block. A single transmission block is transmitted to the receiving entity during each time frame.

In the case of an error detected at the receiving end, a re-transmission request signal is returned to the transmission end in the following time frame. If the transmission rate is great enough to re-transmit the packet in the next time frame, the packet is re-transmitted. If the transmission rate is lower and the size of the packet is larger than what can be transmitted, the packet is divided and transmitted in consecutive time frames (see column 9, line 28, to column 10, line 3).

If the transmission rate is great enough, several packets can be re-transmitted in the same transmission block in the next time frame (see column 10, lines 9-18).

Differences over Rathonyi

Rathonyi and the present invention are directed to different communications systems and different solutions to problems in those communications systems. Rathonyi is directed to a solution to overhead that results from variable transmission rates in cellular communications systems. The present invention is directed to a solution to transmission of large bandwidth data such as video data over a wireless network in real time. Applicants have determined that previous approaches to transmission of large bandwidth data have lead to the requirement of large memory buffers at each end of communication and retransmission of large sized packets in the case of error (i.e., large bandwidth requirement for re-transmission). Thus, the present invention is concerned with reduction in memory, reduction in bandwidth, and performance within a time limit. Though Rathonyi's communications system is constrained by bandwidth, Rathonyi is not concerned with reduction in bandwidth and memory usage.

Unlike the present invention, Rathonyi's communications system transmits and re-transmits entire data packets. Possibly because Rathonyi is concerned with filling up excess overhead, Rathonyi

does not disclose re-transmission of data blocks within a data packet based on an error correction state of each data block. Instead, Rathonyi teaches a method that includes a step of requesting re-transmission of an entire data packet and a step of re-sending the whole packet, or dividing up the data packet for re-transmission of the packet in subsequent frames given the amount of available overhead. Furthermore, because Rathonyi is directed to a variable rate transmission system, the system will have open space in a transmission block only when the transmission rate accommodates a transmission block that is larger than packets to be transferred. Thus, the present invention and Rathonyi's communications system are fundamentally different.

Claim 30, for example, distinguishes over Rathonyi at least in that it recites "a data packet composed of a plurality of error correction blocks", "an error correction state of each error correction block", and "adding a block". In addition, Applicants submit that Rathonyi fails to teach or suggest the claimed step of, "transmitting an error correction state of each error correction block from a receiving end to a transmitting end".

The Office Action states that Rathonyi's teaching of CRC implies that error correction codes are used in detecting errors in packet blocks. Applicants submit that Rathonyi does appear to teach a communications system that performs error detection using a CRC. It does not appear that Rathonyi teaches a hybrid ARQ method that

uses error correction at the receiving end. Thus, Applicants submit that Rathonyi's communications system does not produce an error correction state at the receiving end. As can be seen in Figure 3C of Rathonyi, the receiving end just sends a NAK for one transmission packet without attempting any error correction. In other words, Applicants submit that the NAK sent every time a packet is detected as having an error does not constitute an error correction state.

Thus, Applicants submit that Rathonyi fails to teach each and every feature of claim 30. As the other independent claims have been amended to explicitly recite the step or function of "performing error correction decoding", Applicants submit that the argument for claim 30 applies as well to the other independent claims, as well as their dependent claims.

In addition, Applicants submit that Rathonyi fails to teach the step of adding a block, a retransmission of which has been requested, to a block constituting a data packet to be transmitted next or subsequently from the transmitting end. Rathonyi at column 9, line 66, through column 10, line 3, for example, describes that, "Thus, the packet with the sequence number 8 is divided into three packets assigned sequence numbers 6, 7, 8, respectively, and these three packets are transmitted consecutively in the ninth, tenth, and eleventh frames". Thus, Rathonyi's communications system breaks up a packet in order to re-transmit the entire packet. A divided

portion of a packet is not, for example, added to a block constituting a data packet to be transmitted next.

Further with respect to claims 32 and 33, Applicants submit that Rathonyi fails to teach or suggest at least the claimed, "wherein said error correction state of each error correction block includes identification information of a block that is most lately outputted from said transmitting end, among blocks received by said receiving end." Because Rathonyi does not at least disclose an "error correction state" produced at the receiving end, it does not disclose a number of blocks for which error-correction decoding has finished. Furthermore, Rathonyi's NAK (of Figure 3) does not include identification information of a block that is most lately outputted from the transmitting end. Accordingly, for at least these reasons, Applicants submit that Rathonyi fails to teach each and every element of claims 32 and 33.

Based on the above reasons, Applicants respectfully request that the rejection be withdrawn.

CONCLUSION

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert W. Downs (Reg. No. 48,222) at the telephone number of the undersigned below, to conduct an interview

in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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